



The Blind Spot in Education Statements/Plans for Children with Special Educational Needs

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Child Vision Research Society

19-21st June 2017

Ulster University, Coleraine

Schedule and Abstract Booklet

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Note: Some authors did not give permission for abstract publication

Welcome to CVRS 2017!



We are delighted to welcome you all to Ulster University for the biennial meeting of CVRS. Thanks to all those who submitted abstracts to enable the development of a diverse and interesting programme, showcasing the variety of research across paediatric vision across the world.

This conference has three main themes: childhood visual development, the impact of developmental/neurological problems on vision, and neural plasticity and visual rehabilitation.

Our first Keynote speaker is Professor Anita Simmers, who will speak about recent developments in the understanding of neural plasticity in amblyopia.

Our second keynote speaker is Professor Els Ortibus who will talk about her work in the assessment and diagnosis of Cerebral Visual Impairment with the supplement of brain imaging technologies.

Finally, on the last day of our conference Professor Marjean Kulp will be speaking about the VIP-HIP study and its investigation of hyperopia in preschool children and its effect on educational and visual outcomes.

We are most grateful to the HSC R&D Office of Northern Ireland, TrackSys, and Orthoptic Supplies for their support. We would also like to thank Professor David Elliott for arranging for publication of the conference proceedings and abstracts in Ophthalmic and Physiological Optics.

We really hope you enjoy your stay in the North Coast in NI and CVRS 2017.

Julie-Anne Little, Julie McClelland and Kathryn Saunders

Sponsors

HSC R&D Office, Northern Ireland



Programme Monday 19th June 2017

0830 Registration and Coffee

Session 1

| | | |
|--------------|--------------------------------------|--|
| 9.30 | Welcome: Dr Julie-Anne Little | |
| 9.40 | Aya Sami | Preparation for the EUSCREEN Study: gathering data on vision and hearing screening programmes in 41 European countries |
| 10.00 | Shelley Hopkins | Vision screening outcomes and uncorrected eye conditions in Grade 2 schoolchildren |
| 10.20 | Frea Sloot | Visual acuity measurement at 36 months in population-wide eye screening in the Netherlands: 17-22% failure rate |
| 10.40 | Anna O'Connor | Improving the reliability of paediatric visual acuity testing |

11.00 Coffee Break & Posters

Session 2

| | | |
|--------------|---------------------------|--|
| 11.30 | Prof Anita Simmers | KEYNOTE Amblyopia: what is all the fuss about? |
| 12.25 | Eileen Birch | Self-Esteem in Amblyopic Children |
| 12.45 | Kathleen Vancleef | ASTEROID; an engaging and glasses-free stereotest on a 3D tablet |

1.05pm LUNCH

Session 3

| | | |
|--------------------|----------------------------------|--|
| 1.45 – 3.30 | POSTER WALK (Odd numbers) | |
|--------------------|----------------------------------|--|

COFFEE during poster sessions

Session 4

| | | |
|-------------|-----------------------|---|
| 3.30 | Susan Leat | Can the preference for faces be used to measure recognition acuity in infants? |
| 3.50 | Sean Chen | Experience dependent plasticity of form and motion mechanisms in human amblyopia. |
| 4.10 | F Tinelli | Visual field defects in children with hemiplegia: spontaneous reorganization and training strategies |
| 4.30 | Arvind Chandna | Quantitative characterisation of visual function alterations in children with mild cerebral visual impairment |

5.00 Business meeting (open to all those interested in the future of CVRS)
Drinks Reception and bus leaves for Dinner

7.00pm DINNER

Evening: Conference dinner and Whiskey tasting

9.40am

Title: Preparation for the EUSCREEN Study: gathering data on vision and hearing screening programmes in 41 European countries

Presenting Author: Aya Sami

Sami, Aya 1; Sloom, Frea 1; Bjeloš, Mirjana 2; Stirn Kranjc, Branka 3; Levin, Mari 4; Greczka, Grazyna 5; Stappaerts, Luc 6; Nadarevic Vodencarevic, Amra 7; Bottin, Davide 8; McCullough, Sara 9; Langmann, Andrea 11; Welinder, Lotte 10; Sturm, Veit 12; Simonsz, Huibert J. 1*

Purpose:

To examine the diversity in paediatric vision and hearing screening programmes in Europe, in preparation for the development of a comparative cost-effectiveness model.

Methods:

A questionnaire on vision, hearing and public health screening was developed by a focus group using literature and expert opinion. Questions were structured as multiple-choice with comments in 9 domains, including tests used, professionals involved, age and frequency, which can influence screenings cost-effectiveness. Questionnaires were sent to ophthalmologists, orthoptists and otolaryngologists in all 41 European countries. They were selected based on their expertise and involvement in paediatric screening.

Results:

Representatives of 18 countries have filled out the questionnaire thus far. Vision screening content is mostly decided by the Ministry of Health or Public health organisations. Prevalence's of amblyopia and strabismus at the age of 7 range between 1.4-3.5% and 1.6-5% respectively. Screening professions varied (9); most were ophthalmologist, nurses or general practitioner. Most of them receive no additional training. Target condition was amblyopia, strabismus and refractive error. Visual acuity (VA) is measured at age 3 to 5. Thirteen different VA charts are used. Snellen chart is most used. Inspection, fixation and Fundus red reflex are the most used vision screening tests before the age of 3. Treatment for amblyopia and strabismus is available in all countries, but sometimes limited due to economic or capacity problems. Funding is mostly by health insurance or state.

Conclusions:

The results revealed large differences in VA charts used, professions involved in vision screening, their training, and funding sources.

ORAL PRESENTATIONS Monday 19th June

10.00am

Title: Vision screening outcomes and uncorrected eye conditions in Grade 2 schoolchildren

Presenting Author: Shelley Hopkins

Hopkins, S^a., Black, A.A^a, White, S.^b, Wood, J.M.^a*

^a School of Optometry and Vision Science, Faculty of Health, Queensland University of Technology, Victoria Park Road, Kelvin Grove, QLD, 4059, Australia

^b School of Early Childhood and Inclusive Education, Faculty of Education, Queensland University of Technology, Victoria Park Road, Kelvin Grove, QLD, 4059, Australia

Background:

The impact of undetected vision conditions on a child's ability to perform well in the classroom can be significant; yet, agreement on the cost-effectiveness of school-based vision screenings is still debated in many countries. This results firstly in inconsistencies in the provision of school screenings, and secondly, children having uncorrected vision conditions. This study reports the prevalence of uncorrected vision conditions in primary schools in South-East Queensland, Australia.

Methods:

Participants included 245 Grade 2 children from five state schools in Brisbane, Australia. Four schools were from low socio-economic regions. Standard vision screenings were conducted and participants classified as satisfactory or unsatisfactory. Comprehensive eye examinations were performed at a second visit on those participants classified as unsatisfactory.

Results:

Of the 245 participants screened, 62 (25%) were categorised as unsatisfactory and underwent comprehensive eye examinations by an optometrist. Outcomes from these were: 39 participants required spectacles, two participants required vision training, five were identified as red-green colour vision deficient, and ten required referral to an ophthalmologist. Twenty participants classified as unsatisfactory in the screening required no further management.

Conclusions:

These findings highlight the importance of early vision screening in school-age children. Seventeen per cent of children screened had uncorrected vision conditions that required optometric management. Detection and treatment of eye conditions in this age group has the potential to minimise any future impact that these conditions would have on their visual prognosis and on their learning potential.

Acknowledgments: This work was supported by the Lord Mayor's Charitable Foundation.

ORAL PRESENTATIONS Monday 19th June

10.40am

Title: Improving the reliability of paediatric visual acuity testing

Presenting Author: Anna O'Connor

Anna R O'Connor^{1}, Laurence P Tidbury¹, Hazel Kay², David Newsham¹ and Ashli F Milling¹.*

¹Directorate of Orthoptics and Vision Science, University of Liverpool.

²Hertfordshire community NHS trust

Background

Visual acuity (VA) results are known to vary between visits, with test-retest variability (TRV) reports of one or more lines on a range of logMAR tests, which can be larger in picture based tests. One contributing factor may be that differing scores imply a change in optotype size, but actually reflect a difference in the number of optotypes of the same size seen. This study aims to evaluate the TRV using a true VA score determined by small, equal changes in the size of every optotype.

Methods

Adults were recruited and assessed wearing their habitual correction. Two VA tests were used, the standard letter logMAR chart (presented on a PC using the Thomson software) with the optotypes randomised between tests, and a new computerised test, utilising the new Kay pictures optotypes. The computerised test was presented using PsychoPy, with a linear progression of picture size and VA determined by a staircase procedure. Tests were performed twice, binocularly, with the order of testing randomised.

Results

VA was measured in 158 subjects. Mean VA's were -0.246 ± 0.153 (SD) logMAR (picture test) and -0.147 ± 0.105 logMAR (letter test). TRV values (SD of mean difference $\times 1.96$) were 0.0817 (picture test) and 0.0972 (standard test).

Conclusions

The TRV on the new computer test is slightly lower than for the standard letter test, but considerably lower than the TRV for the new Kay pictures book (0.146 – data from a previous study). This is a positive step towards improving the repeatability of VA measurements in children.

11.30am

**Keynote Speaker: Professor Anita Simmers DBO MPH
PhD FRSB FRSA**



Professor of Vision Science, Glasgow Caledonian University, UK

Title: Amblyopia: what is all the fuss about?

In the last 10 years there has been a rekindling of interest in amblyopia; a new understanding of the underlying patho-physiology based in part on new brain imaging methods such as functional MRI, and a massive shift in our thinking about the treatment of amblyopia fuelled in part by a number of important clinical trials. Experience- dependent plasticity is closely linked with the development of sensory function, however, there is also growing evidence for plasticity in the adult visual system. Recent experimental and clinical evidence for the rehabilitation of amblyopia will be discussed.

Biography

Initially trained as an orthoptist Professor Simmers gained an insight into clinical practice before embarking on a scientific career. First with a Masters in Public Health and Community Medicine from Glasgow University (1993) followed by a PhD in Clinical Visual Science (1997). Anita has a wealth of postdoctoral research experience in clinical and behavioral neuroscience both nationally and internationally including a prestigious MRC Fellowship at the Institute of Ophthalmology, UCL. She has secured highly competitive research funding from MRC, Wellcome, Chief Scientists Office and leading UK research charities. Professor Simmers has a broad portfolio of peer review for prestigious journals and leading funding organisations and charities as well as contributing to national Priority Setting Partnerships in sight loss and vision.

More recently she has taken up the role of Head of Department Life Sciences, Glasgow Caledonian University. The Department of Life Sciences is committed to the pursuit of excellence in learning and teaching, research, knowledge transfer and commercialisation throughout its four subject groups: Vision Science, Physiology and Pharmacology, Human Nutrition and Dietetics and Biomolecular, Microbiology and Food Sciences.

Professor Simmers is an invited Fellow of the Royal Society of Biology, Fellow of the Royal Society of Arts, and liveryman of the Worshipful Company of Spectacle Makers. She is member of GCU Women in STEMM Group, part of the Athena Swann Working Group and an Aurora mentor and role model.

"I am passionate about visual neuroscience and the interface between clinical and laboratory research. My research interests lie in the field of amblyopia, this is a widespread developmental visual deficit that has puzzled clinicians and scientists for decades. All my investigations are non-invasive, as well as adding to basic science they also provides critical information on the clinical management of a common eye condition, in the long-term I hope to develop successful treatment/training strategies for a range of visual disorders"

ORAL PRESENTATIONS Monday 19th June

12.25pm

Title: Self-Esteem in Amblyopic Children

Presenting Author: Eileen Birch

Eileen E. Birch PhD, Yolanda S Castañeda BSN, Christina Cheng-Patel BS CCRP, Sarah E Morale BS, Krista R Kelly PhD*

Pediatric Vision Laboratory, Retina Foundation of the Southwest, Dallas, TX

BACKGROUND:

Scholastic achievement, social acceptance and physical competence are key determinants of self-esteem in school-age children. We examined these key determinants in amblyopic children and normal controls, and assessed their relationship to academic performance and motor skills.

METHODS:

Amblyopic children (n=26; grades 3-8) with strabismus, anisometropia, or both completed the Self-Perception Profile for Children and were compared to age-similar controls (n=12). The instrument provides separate scores for 5 competence domains (Scholastic, Social, Athletic, Physical Appearance, Behavioral Conduct), and a separate score for Global Self-Worth. Visual acuity (logMAR, e-ETDRS protocol), binocular fixation stability (BCEA, EyeLink 1000), reading speed (words/min, Readalyzer®), and motor skills (Movement ABC-2; manual dexterity, aiming & catching, and balance domains) were also tested.

RESULTS:

Compared with normal controls, amblyopic children had significantly lower Scholastic, Social, and Athletic Competence scores ($p=0.048$, 0.007 , and 0.046 , respectively) and a lower Global Self-Worth score ($p=0.014$). There were no significant differences in Physical Appearance or Behavioral Conduct scores. Scholastic Competence was correlated with reading speed ($r=0.54$, $p=0.004$) and manual dexterity ($r=0.57$, $p=0.002$). Social Competence was correlated with aiming & catching ($r=0.56$, $p=0.003$). There was a trend for Athletic Competence to be associated with manual dexterity ($r=0.38$, $p=0.06$) and aiming & catching ($r=0.38$, $p=0.06$). No associations were found with visual acuity or fixation stability.

CONCLUSIONS:

Amblyopia may lower perceived scholastic, social, and athletic competence and, in turn, global self-worth. These alterations in self-perception accompany measurable deficits in reading speed and motor skills. Academic accommodations and rehabilitation of amblyopia may benefit key determinants of self-esteem.

Grant Support: National Eye Institute EY022313, Knights Templar Eye Foundation #16-2015-CS, Thrasher Research Fund, Orix Foundation, Strauss Foundation, Young Foundation

ORAL PRESENTATIONS Monday 19th June

12.45pm

Title: ASTEROID; an engaging and glasses-free stereotest on a 3D tablet

Presenting Author: Kathleen Vancleef

Kathleen Vancleef, Ignacio Serrano-Pedraza, Graham Morgan, Craig Sharp, Carla Black, Therese Casanova, Jessica Hugill, Sheima Rafiq, Michael Clarke, Jenny Read*

Newcastle University, UK

Measuring stereoacuity in children can be challenging. Current tests are not very engaging for young children, have low reliability, require a fixed viewing distance, and children may not be comfortable wearing 3D glasses. We have developed an engaging and Accurate STEReotest On a mobile Device (ASTEROID).

Our test runs on a glasses-free 3D tablet and viewing distance is automatically monitored and corrected for by the front camera. A dynamic random-dot stereogram is shown to avoid monocular cues. We integrated a sophisticated computer algorithm (a Bayesian staircase) that makes a precise estimate of the individual's stereothreshold based on their answers on previous trials. To keep children engaged the test is embedded in a game. Orthoptists and children were involved at all stages of development.

In 261 children between 2 and 11 years old, we observed a correlation of 0.52 ($p < 0.001$) between stereothresholds on ASTEROID (v0.933) and the Randot Preschool stereotest. However, stereothresholds on ASTEROID were significantly higher than on Randot ($t_{(256)} = -20.59$, $p < 0.001$). 35% of the children with normal vision failed on ASTEROID (thresholds > 1000 arcsec), while only 5% failed on Randot. The three children that failed a Cover Test, which indicates strabismus, could not demonstrate stereovision with ASTEROID or Randot. Of the five children with a significant difference between left and right visual acuity, which points to anisometropic amblyopia, four also failed on ASTEROID, all failed on Randot.

In later ASTEROID versions, we have modified the test delivery to reduce the number of failures in children with normal vision.

Acknowledgements: This abstract presents independent research commissioned by the Health Innovation Challenge Fund (HICF-R8-442, WT102565/z/13/z), a parallel funding partnership between the Wellcome Trust and the Department of Health. The views expressed in this abstract are those of the authors and not necessarily those of the Wellcome Trust or the Department of Health.

ORAL PRESENTATIONS Monday 19th June

3.30pm

Title: Can the preference for faces be used to measure recognition acuity in infants?

Presenting Author: Susan Leat

Susan J. Leat, Norah Alkanhal, Elizabeth Irving, Darren Gigliozi*

School of Optometry and Vision Science, University of Waterloo, Canada

Background: The purpose of this project is to investigate the possibility of developing a test of recognition (form) visual acuity (VA) for infants aged 3-20 months. Currently, it is only possible to measure resolution (grating) VA in this age group. In this preliminary study we investigated the “strength” of the child’s preference for schematic happy faces versus scrambled faces or non-faces (dots) when presented in a preferential looking format.

Methods: In experiment 1, suprathreshold targets were presented either on preferential looking cards or on a computer screen with an eye movement tracker. Observers, who were unaware of the side of the target, judged the child’s looking responses. The percentage of correct responses were calculated. In experiment 2, the use of habituation for the non-faces stimuli was used (two presentations of two non-face targets were presented between each face/non-face pair).

Results: Eight infants took part in experiment 1 (mean age = 10.9 ± 2.1 months). With the eye movement tracker, the percentage of correct looks was 53% and 62% for faces compared to scrambled faces and dots respectively. For the cards, these percentages were 55 and 51% respectively. Eleven infants participated in experiment 2 (mean age = 10.9 ± 3.5 months). Using habituation, these percentages were 45 and 55% respectively in the eye movement tracker and 60 and 54% respectively for the cards.

Conclusion: The preference for faces, even with habituation, is not sufficiently strong in this age group to use for recognition visual acuity measurement.

Acknowledgements: Funded by Research Incentive Fund, University of Waterloo, Canadian Optometric Education Trust Fund, and Saudi Arabian Cultural Bureau.

ORAL PRESENTATIONS Monday 19th June

3.50pm

Title: Experience dependent plasticity of form and motion mechanisms in human amblyopia.

Presenting Author: Sean Chen

*Sean I. Chen^{*1}, Arvind Chandna², Anthony M. Norcia³.*

1. Suite 22, The Galway Clinic, Doughiska, Galway, Ireland.

2. The Smith-Kettlewell Eye Research Institute, San Francisco, California CA94114, USA.

3. Department of Psychology, Jordan Hall, Rm 334, 450 Serra Mall, Stanford University, California CA 94305, USA.

Background

Deprivation of patterned visual input during early visual development leads to both anatomical and functional losses in the deprived eye. There have been conflicting reports in the human literature as to whether the non-deprived eye shows super-normal behaviour.

Methods

Here we use spectral analysis of Visual Evoked Potential responses to isolate relative position and motion/transient responses in children who experienced deprivation of high-spatial frequency input in one eye due to chronic optical defocus (anisometropia, n=10, mean age 6.3 years). We also compare them to a group of typically developing children (normal controls, n=16, mean age 5.14 years).

Results

We find in the previously untreated children with amblyopia that position-specific responses are super-normal in the non-deprived eye and are markedly subnormal in the deprived eye. Motion/transient responses, on the other hand show no difference from normal in the non-deprived eye and milder losses in the deprived eye. After a period of occlusion of the initially non-deprived eye, the position signal decreased in this eye and increased in the initially deprived eye. After occlusion the motion/transient signals also reduced in the non-deprived / dominant eye ($p=0.01$, ANOVA) but no significant change occurred in the initially deprived eye.

Conclusions

The disparate effects of deprivation and treatment on the position and motion/transient responses suggest that they arise from separate neural populations with different developmental sensitivities.

Acknowledgements: Mark Pettet. Vladimir Vildavsky.

Funding: Guide Dogs for the Blind UK (OR2001-99a), The Smith-Kettlewell Eye Research Institute.

4.10pm

Title: Visual field defects in children with hemiplegia: spontaneous reorganization and training strategies

Presenting Author: Francesca Tinelli

F.Tinelli^{a,}, G. Purpura^a, G.Cioni,^{a,b}*

^a Department of Developmental Neuroscience, IRCCS Stella Maris Scientific Foundation, University of Pisa, Italy

^b Department of Clinical and Experimental Medicine, University of Pisa, Italy

Background:

Congenital or early acquired hemiplegia may be associated to visual field (VF) restrictions with important consequences in children participation. This is relevant as mechanisms of adaptive plasticity, both spontaneous or treatment induced, were shown to be effective in partially restoring the function. Our objectives were: i) to assess visual functions in children with hemiplegia correlating the results with brain imaging; ii) to study spontaneous reorganization in subjects with visual field defect; iii) to perform an intensive audio-visual stimulation of the affected field in selected cases (induced reorganization).

Methods:

Fifty subjects with hemiplegia were selected from children referred to our Department. All subjects underwent a full assessment of visual functions including a computerized measure of VF. MRIs were looked for abnormalities of the optic tract and the occipital cortex. We studied some of these subjects psychophysically to investigate if they had unconscious perception in the blind hemifield. In those subjects without unconscious perception we administered a 4 week intensive audio-visual treatment.

Results:

All subjects with optical radiation and or occipital cortex lesions showed visual field defects. The most part of subjects with congenital brain lesions showed spontaneous reorganization with blindsight while children with acquired brain lesions didn't show blind-sight but improved after the audio-visual training.

Conclusions:

Children with early brain damage appear to have a stronger subjective awareness of stimuli hitting the blind visual field, reported as an unconscious feeling that something is present in that visual field (blindsight) respect to children with acquired brain lesions.

ORAL PRESENTATIONS Monday 19th June

4.30pm

Title: Quantitative characterisation of visual function alterations in children with mild cerebral visual impairment

Presenting Author: Arvind Chandna

,^{1,2}*Arvind Chandna, ²Sylwia Migas, ²Susan Anderson, and ³Anthony M. Norcia.

¹Smith Kettlewell Eye Research Institute, San Francisco, USA, ² Alder Hey Children's Hospital, Liverpool, UK, ³Stanford University, Stanford, USA.

Background:

Cerebral Visual Impairment (CVI) is caused by a range of adverse events during preterm and early life resulting in damage to retrochiasmatic areas of the brain which manifests as a spectrum of visual difficulties. Children with mild CVI and near normal visual acuity have behaviorisms suggestive of higher visual function deficits (HVFDs) such as motion perception and face recognition. This study characterizes HVFDs through structured history taking and evoked potential recording.

Methods:

35 children (age range 4.4 yrs. – 14.4 yrs.) with an established diagnosis of mild CVI and LogMAR acuity better than 6/12 and 27 visually normal children and (age range 3.70 yrs. – 16.76 yrs.) participated in the study. In addition to structured history taking (CVI Question Inventory, CVIQI) we recorded Steady State Sweep Visual Evoked Potentials (SSVEPs) responses to grating and vernier acuity; relative and absolute motion; contour integration and face stimuli in all children.

Results:

CVIQI reveals a significant preponderance of HVFDs in the CVI group in contrast to normal controls. SSVEP grating and vernier acuity and absolute motion responses were similar in both groups. However, children with CVI showed significant losses of relative motion response. Face responses are probably atypical in the CVI group and we failed to elicit reliable responses to contour integration.

Conclusion:

CVIQI is able to elicit HVFDs in children with mild CVI compared to normal children. Consistent with near normal VA in mild CVI, grating and vernier thresholds are not affected but HVFDs such as relative motion are significantly impaired.

Funded by grant from Vision4Children (The Littler Trust)

Programme Tuesday 20th June 2017

Session 5

| | | |
|------|---------------|---|
| 9.00 | Naomi Dale | Developmental profiles and trajectories, including 'developmental setback' and effectiveness of early intervention, from 1 to 3 years of age in children with severe visual impairment (VI): OPTIMUM cohort |
| 9.20 | Hanna Sakki | Visual perceptual abnormalities in children with congenital cerebral visual impairment |
| 9.40 | Lea Hyvarinen | Visual Processing problems in School age assessments – a task for teams |

Session 6

| | |
|---------------|----------------------------|
| 10.00 – 12.00 | POSTER WALK (Even numbers) |
|---------------|----------------------------|

COFFEE during poster sessions

11.15 EUSCREEN Meeting

Session 7

| | | |
|-------|------------------|--|
| 12.00 | Prof Els Ortibus | KEYNOTE An integrative approach of the assessment of CVI |
|-------|------------------|--|

12.55pm CVRS PHOTO!

1.00pm LUNCH

Session 8 CVI from other stakeholder perspectives

| | | |
|------|----------------------|---|
| 2.00 | Helen St Clair Tracy | Making CVI accessible to the layman – approaches, techniques and outcome |
| 2.20 | Nicola McDowell | Unmasked simultanagnosia; Gaining a better understanding of this impairment from the inside |
| 2.40 | Sara McCracken | Education Advocacy delivered through the Family Insight project |
| 3.00 | Panel discussion | |

3.20 Coffee BREAK

Session 9

| | | |
|------|-----------------|--|
| 3.50 | Cathy Williams | Severe intraventricular haemorrhage (IVH) with posthaemorrhagic ventricular dilatation after premature birth is associated with multiple visual impairments at age 10-11 years |
| 4.10 | Marlou Kooiker | Evidence for cerebral visual processing dysfunctions at 1y and 2y in children born extremely preterm |
| 4.30 | Jenefer Sargent | Assessing functional vision skills in children with severe cerebral palsy: findings from a structured history taking and assessment approach |

Approx. 7.00pm start DINNER & Ceilidh

ORAL PRESENTATIONS Tuesday 20th June

9.00am

Title: Developmental profiles and trajectories, including ‘developmental setback’ and effectiveness of early intervention, from 1 to 3 years of age in children with severe visual impairment (VI): OPTIMUM cohort

Presenting Author: Naomi Dale

**Dale, Naomi Jane^{1,2}, Sakkalou, Elena¹, O'Reilly, Michelle¹, Springall, Clare², Salt, Alison^{1,2}*

1. Clinical Neurosciences, UCL Great Ormond Street Institute of Child Health UK,

2. Developmental Vision service, Great Ormond Street Hospital NHS Foundation Trust, UK

Background

Developmental progress is highly vulnerable in young children with congenital VI with risk of severe delays and plateau'ing/ regression ('developmental setback'). This study set out to prospectively investigate developmental status and progress in a representative national cohort (OPTIMUM) of children with congenital disorders of the peripheral visual system (CDPVS).

Methods

69 infants (mean 13 months) were assessed on Sensorimotor Understanding (SMU), Verbal Comprehension (VC) and Expressive Language-Structure (EL-S) subscales, Reynell Zinkin Scales, at one year (T1), two (T2) and three years (T3). Raw scores were transformed to age equivalents (VI norms) and converted to developmental quotients (DQ). Cross sectional and longitudinal analyses are presented.

Results

The majority (72-77%) were in the VI adjusted 'normal' DQ range (>80) at each time point but the profoundly VI – light perception at best, showed significantly more delay ($p<0.5$). 50% of total sample showed deceleration in SMU T1-T2, but more steady state trajectory in all subscales T2-T3 (58% SMU, 75% VC, 68% EL-S). 8% showed 'developmental setback' from T1-T3 (30% PVI, 2% SVI). The effect of early intervention (including the Developmental Journal VI) on developmental trajectories will also be presented.

Conclusions

Developmental status and rates of change were vulnerable in infants and young children with VI, particularly in SMU with challenge in developing object concepts in the first to second year of life. The PVI were most at risk of delays, deceleration in SMU and developmental setback. The impact of specialized developmental intervention on these vulnerable developmental trajectories will be discussed.

Acknowledgements: Funding by Fight for Sight, Royal National Institute for Blind People, Great Ormond Street Hospital Children's Charity

9.20am

Title: Visual perceptual abnormalities in children with congenital cerebral visual impairment

Presenting Author: Hanna Sakki

Hanna Sakki^{1}, Richard Bowman^{1,3}, Roopen Kukadia³, Jenefer Sargent², Naomi Dale^{1,2}*

¹UCL Institute of Child Health, Developmental Neurosciences Programme, London, ²Great Ormond Street Hospital Neurodisability Service, London, ³Great Ormond Street Hospital Ophthalmology Department, London

Background

Childhood cerebral visual impairment (CVI) is poorly understood, with a heterogeneous symptom presentation of visual difficulties and high incidence of comorbidities. Alongside visual impairment, visual perceptual difficulties are commonly reported. Within a systematic investigation of ophthalmology, basic vision, cognition and comorbid conditions, this study explored whether children with suspected or diagnosed CVI have visual perceptual abnormalities.

Methods

Children aged 5-16 years (recruitment ongoing, target n=40) with a previous diagnosis or suspicion of CVI and visual acuity (VA) better than logMAR 1.0 participated. Participants underwent ophthalmological examination, basic vision assessment (including near VA), cognitive assessment (verbal comprehension index - VCI of WISC-IV/WPPSI-V), and visual perception assessment (TVPS-3). Medical history and diagnoses were obtained from parent questionnaires and medical records.

Results

Paired t-tests showed that participants had significantly poorer TVPS-3 scores than VCI scores. Independent samples t-tests showed no effects of stereopsis, strabismus, cerebral palsy or previous CVI diagnosis on TVPS-3 scores. No Pearson correlations were found between TVPS-3 scores (total, basic, complex) and age, VA, gestational age or VCI. Sequencing correlated positively with VCI.

Conclusions

Although in the average range for VCI, participants showed significantly lower TVPS-3 scores (borderline-low range). Sequencing (working memory) has a high cognitive load, so a correlation with VCI was unsurprising. All other areas of visual perception were independent of cognition, age, basic vision, presence of comorbidities and previous diagnosis of CVI. These findings suggest that visual perceptual abnormalities may be a core clinical feature in the spectrum of CVI, even in children with normal VA.

Acknowledgments

This research was jointly funded by Ulverscroft Vision Research Group and NIHR Biomedical Research Centre at Great Ormond Street Hospital for Children NHS Foundation

ORAL PRESENTATIONS Tuesday 20th June

9.40am

Title: Visual Processing problems in School age assessments – a task for teams

Presenting Author: Lea Hyvarinen

School age assessments gather information that the educational vision teams at schools and the medical vision rehabilitation teams, ophthalmological and neuropaediatric groups together, use to learn about students' vision.

Children with visual processing problems have great variation of atypical cortical functions 1) in early processing functions of the occipital lobe, 2) in the recognition functions of the temporal lobe, 3) in the spatial functions and 'vision for doing' of the parietal lobe and/or 4) in the mirror neuron networks. A student may have only one disorder, like prosopagnosia, but usually students have several disorders of visual processing.

Teachers in the educational vision team use their observations to create the Profile of Visual Functioning for each student. It is specific to each school and covers normal and atypical functions that are found important in the school. It guides the medical vision team to assess and report clinical findings. Clinical tests are more numerous than in routine examinations: oculomotor functions, accommodation, visual acuity tests, near and distance, and tightly spaced near tests to assess increased crowding; grating acuity; contrast sensitivity; motion perception; visual fields; visual adaptation, and color vision. Additional tests and sometimes consultations of neuropsychologists are needed. Other disorders and their effect on the use of vision are described.

Students are examined when medications do not disturb sensory or oculomotor functioning but also soon after medications are taken, to assess eye movements and use the findings to plan classroom work. During the medical examinations, students' head and trunk posture should be stable and well supported, like they should be in the classroom.

Definition of the visual needs for assessment varies in hospitals in many countries. Some hospitals use visual acuity value 0.3, 6/18, 20/60 as the limit for further assessment. Since visual acuity values of many students with Cerebral Palsy and students after operations of brain tumors often have better visual acuity than 0.3 but have complex problems in visual processing, they are not classified as visually impaired and are not properly examined. In some school districts in the USA only students with Low Vision, i.e. visual acuity 0.3, 6/18, 20/60 or less get special education services. The definition of quality of vision for early intervention and vision rehabilitation should be discussed internationally, because students with disorders in visual processing and also other disorders may have specific, often complex problems that require adaptations in learning materials and test situations at school, even if their visual acuity at distance is normal.

Profile of Visual Functioning has been helpful in teaching both educational and medical teams to choose only a few problematic questions for each assessment. After the findings of the educational and medical teams are compared, a Summary of the student's situation is written. Over the years the teams learn more about each student and thus learning strategies and teaching techniques improve.

KEYNOTE PRESENTATION Tuesday 20th June

12.00pm

Keynote Speaker: Professor Els Ortibus

Neuro-paediatrician

**University Hospitals Leuven,
Centre for Developmental Disabilities, Leuven
KL University Leuven**



Title: An integrative approach of the assessment of CVI

CVI is a neurological disorder in which visual perception is disturbed due to neurological causes, typically situated behind the optic chiasm. Currently, in the developed countries, it is the more frequent cause of visual disability and +-50% of children having CP are reported to have one or other characteristic of CVI. The condition has a large negative impact on all aspects of development and that is why early diagnosis is mandatory. Since CVI is very heterogeneous and has overlap with other conditions such as DCD or ASD, diagnosis is often delayed or CVI goes unnoticed.

This talk will handle the approach of CVI at different levels, going from neurobiological factors over the development of neuropsychological tools to behavioral measures. We will highlight the relation between specific visual perceptual (dys)functions and results of brain imaging, discuss the development of new tools, for which a fruitful collaboration between vision scientists and clinicians was indispensable, and review the possible value of questionnaires.

Biography

Els Ortibus trained as a neuropediatrician and rehabilitation physician in Leuven, Belgium. She finished her PhD on Clinical and Radiological Measures of CVI, focussing on the ventral stream, in 2011. Since then, she continued her work on the development of new diagnostic tools for CVI in young and multiple disabled children and their relation with brain damage. Since 2012, she's the head of the Centre for Developmental Disabilities in Leuven, where she runs the CVI clinic and coordinates the follow up of preterm born infants. She is also a staff member of the Cerebral Palsy Reference Centre of the University Hospitals in Leuven. Her main research topics in addition to CVI are the relation of brain damage with upper and lower limb function and (early) intervention in children with cerebral palsy.

ORAL PRESENTATIONS Tuesday 20th June

2.00pm

Title: Making CVI accessible to the layman – approaches, techniques and outcome

Presenting Author: Helen St Clair Tracy

CVI Scotland

Parents hold a wealth of expert experience. They share this informally through social media and support groups but it is not structured. CVI Scotland aims to bring parents together to engage in dialogue around their personal knowledge and experience, with additional direct input from those affected by CVI and help from expert advisors, to create a custom designed website based platform for knowledge to grow.

Small groups of parents are formed, between four and eight, and a conversation commences around a given subject. The only rule is that it is the parents' first hand experiences that are needed, not the extended opinions of professionals involved in the child's care. This way the data is first hand and raw.

It is a knowledge creating exercise, and it is critical that we neither try to squeeze findings into a pre-existing box, nor deliberately avoid boxes.

The process requires expert guidance including from the science community, people who can leave their pre-conceptions in a metaphorical toolbox and utilise free thinking. Parents find the process enlightening and rewarding.

In future, a two-tiered system is needed, where theories created by parents are considered and researched by scientists and academics, to forward knowledge of CVI, to benefit our children.

Our initial work is now available on cviscotland.org. Feedback from this group will be appreciated.

ORAL PRESENTATIONS Tuesday 20th June

2.20pm

Title: Unmasked simultanagnosia; Gaining a better understanding of this impairment from the inside

Presenting Author: Nicola McDowell

Qualified Teacher for Children with Visual Impairment (QTVI) and Orientation and Mobility Specialist, Blind and Low Vision Education Network New Zealand (BLENNZ)

CVI is the commonest cause of visual impairment affecting children in the developed world, but how much is known about the personal impact of the different elements of this condition? Bilateral injury to the posterior parietal lobes causes dorsal stream dysfunction, which can be broken down into three main visual issues; simultanagnosia, optic ataxia and apraxia of gaze.

Although all three of these impairments are well defined, little is known about the emotional impact living with these conditions can have on those affected, especially if undiagnosed for a long period of time. I have first-hand experience of this, having lived with undiagnosed CVI for seventeen years following a brain haemorrhage as a teenager.

While each of these issues can be equally disabling, simultanagnosia has had the greatest impact on my life. The stress that occurs when in a cluttered environment significantly reduces my visual abilities, which results in the complete meltdown of my confidence, self-esteem, social competence and cognitive abilities. Often, when in this heightened emotional state, other senses are affected, which leaves me feeling that I cannot trust my vision or other sensory information.

What makes this condition even more challenging, is that it impairs non-conscious visual functions. Thus, like me, those affected are unable to understand that their issues relate to their vision. Long term this can be potentially erosive both for affected children and for adults, which is why it is important that children with CVI are diagnosed, understood and managed appropriately as early as possible.

ORAL PRESENTATIONS Tuesday 20th June

2.40pm

Title: Education Advocacy delivered through the Family Insight project

Presenting Author: Sara McCracken

Sara McCracken, Angel Eyes NI, Rosaleen Dempsey, RNIB Northern Ireland*

The Family Insight Project is a five-year project between Angel Eyes and RNIBNI. It aims to empower families across Northern Ireland (NI) who have children with a vision impairment aged 0-12 years to offer an Educational Advocacy Service delivered by Angel Eyes NI and extend RNIB's Family Services to the whole of NI.

We conducted a survey of 108 families and the results of this formed the basis of the Family Insight Project. Parents told us they find the education system difficult to navigate to get the best outcome for their child with 55% reporting a lack of confidence in accessing statutory education support.

Education Advocacy Service (delivered through The Family Insight Project) offers:

- understanding how a child's eye condition can impact their educational needs, and the various strategies and resources that can be implemented by a school to support curriculum access and learning
- advice on the various stages and requirements of the Code of Practice, including assessment and Statementing
- accompanying parents to meetings where an impartial third party may be beneficial – supporting positive dialogue through which parents feel better informed and confident in having their views heard
- signposting, and when appropriate, making referrals to other relevant services and organisations.

First year evaluation results showed an increase in understanding, support, knowledge, (self) advocacy and confidence in parents when tackling educational issues after engaging with the Family Insight Project. The KPI for year one was to engage with 32 families; this was exceeded by 94 families participating. This demonstrates a latent demand for the service, as highlighted in the initial research.

Acknowledgments: The Family Insight Project is funded by The Big Lottery for five years.

4.10pm

Title: Evidence for cerebral visual processing dysfunctions at 1y and 2y in children born extremely preterm

Presenting Author: Marlou Kooiker

Marlou JG Kooiker^{a}, Johan JM Pe^b, Mark Vonk^a, Johannes van der Steen^a, Irwin KM Reiss^b*

a. dept. Neuroscience, Erasmus MC Rotterdam

b. dept. Neonatology, Erasmus MC – Sophia, Rotterdam

Background

Children born extremely preterm (<30 weeks) are at high risk of neurological damage and concurrent cerebral visual dysfunctions. With a recently developed automated method based on eye tracking, visual processing delays were found already at 1 year of age, even without evident brain damage¹. We investigated whether these delays persisted over age and if they depended on the severity of brain damage.

Methods

We included 91 children born extremely preterm at 1y and followed 40 of them at 2y of corrected age. 40% of children did not show brain damage on MRI or ultrasound, the other 60% had evident brain damage at 30 weeks. We recorded the severity of brain damage with Woodward scales². We quantitatively measured viewing reaction times to specific visual information (form, color, motion, contrast) using an eye tracking paradigm.

Results

The majority of preterm children showed delayed reaction times to visual information. Children with brain damage had significantly slower reaction times to color, form and motion at 1y and 2y than children without brain damage. The severity of overall gray and white matter damage at 30 weeks was related to slower reaction times to these types of visual information ($r^2=0.40$ to 0.48).

Conclusions

We showed evidence for delayed visual processing in children born extremely preterm at 1y and 2y of age. More severe brain damage was a risk for stronger delays, particularly in cerebrally mediated visual processing functions. Future work is directed toward providing affected children with tailored visual rehabilitation early in development.

Acknowledgements

This research was funded by NOVUM (stichtingnovum.org).

¹ Pel JJM, Dudink J, Vonk M, Plaisier A, Reiss IKM, van der Steen J (2016). Early identification of cerebral visual impairments in infants born extremely preterm. *Dev Med Child Neurol* doi:00.1111/dmcn.13115

² Woodward LJ, Anderson PJ, Austin NC, Howard K, Inder TE (2006). Neonatal MRI to predict neurodevelopmental outcomes in preterm infants. *J Engl J Med* 355:685-694.

4.30pm

Title: Assessing functional vision skills in children with severe cerebral palsy: findings from a structured history taking and assessment approach

Presenting Author: Jenefer Sargent

Consultant Paediatrician, Wolfson Neurodisability Service, Great Ormond St Hospital for Children, London, UK

Introduction

Children with cerebral palsy may have poor hand and bulbar skills restricting play, learning and expressive communication. The use of vision is critical for sensory input (watching partially compensates for doing), and for communication output (active fixations may function as a pointing gesture). The crucial importance of vision for these children, combined with the known increased risk of ocular/visual disturbance, should guarantee comprehensive vision assessment yet this is often not the case. Moreover, children's functional use of vision during play and communication may be poorly described despite observations of active gaze being key to assessment of communication and development.

Patients/methods

A structured history taking approach was devised in order to elicit basic descriptions of a child's looking skills, including fixation quality, fixation shifts, and confidence in determining fixation target during play. Functional visual assessment followed.

Of 124 children referred in a 2 year period to a specialist communication clinic, the 33 children who were described as using eye-pointing, or referred with explicit questions about functional visual skills or the use of eye-gaze access technology, were assessed.

Results

Parents provided descriptive information about their child's patterns of fixation. In 22/33 children assessment findings largely matched parental descriptions. However, in a notable proportion of these cases, clinical findings conflicted with skills reported by referring therapists.

Conclusion

In children with limited movement, a structured history yields descriptions of functional visual skills for communication which assessment can investigate. Such history taking could be a useful tool for the therapist.

Not supported by external funding

Programme Wednesday 21st June 2017

Session 9

| | | |
|-------|-------------------|---|
| 9.00 | Prof Marjean Kulp | KEYNOTE The impact of uncorrected hyperopia on literacy |
| 10.00 | Jim Gilchrist | Differences in reading ability are associated with differences in visual perceptual skills in primary school-children |
| 10.20 | Krista Kelly | Slow reading and fine motor deficits in school-age children with anisometropic amblyopia |

10.40 **Coffee break**

Session 10

| | | |
|-------|--------------------|--|
| 11.20 | Carol Westall | The feasibility of adding retinal nerve fibre layer thickness measures to ERG assessments for monitoring vigabatrin treatment in young (< 3 years) children. |
| 11.40 | Aarti Patel | Retinal and optic nerve development of full term and premature born children investigated by handheld spectral domain optical coherence tomography (HH SD-OCT) |
| 12.00 | Arijit Chakraborty | Naso-temporal asymmetry for global motion perception in uniocular children |
| 12.20 | Daphne McCulloch | Noise coherence as a threshold measure of stereopsis |

12.40 **Lunch**

Session 11

| | | |
|------|----------------------------|--|
| 1.30 | Siobhan Ludden | Reading and attention in relation to naturalistic accommodation response in typical children |
| 1.50 | Valdeflors Vinuela-Navarro | Evidence for fixation instability in children with Down syndrome |
| 2.10 | T Rowan Candy | Vergence responses to oscillating disparity in 5-10 week-olds |

2.30 **Announcement of Presentation Winners**

CRVS next meeting venue announced

3.00pm **Conference closes**

3.15pm **Bus leaves for Giant 's Causeway visit. All delegates welcome. Note there will be some walking involved.**

KEYNOTE PRESENTATION Wednesday 21st June

9.00am

Keynote: Professor Marjean Kulp

**Distinguished Professor
Ohio State University, Columbus**



Title: The Impact of Uncorrected Hyperopia on Academic and Visual Skills in Preschoolers: Results of the Vision In Preschoolers - Hyperopia In Preschoolers (VIP - HIP) Study

Purpose:

To compare educational skills (early literacy, attention, visual-motor, visual perception) in uncorrected hyperopic and emmetropic 4- and 5-year-old children attending preschool or kindergarten, and to evaluate their association with visual function.

Methods:

Vision examination included cycloplegic refraction to identify hyperopia ($\geq 3D$ to $\leq 6D$ sphere in at least one eye, astigmatism $\leq 1.5D$, anisometropia $\leq 1D$) or emmetropia (hyperopia $\leq 1D$; astigmatism, anisometropia, and myopia each $< 1D$). Near visual acuity (VA) and stereoacuity at 40cm and accommodative response at 33cm were also assessed. Masked examiners performed the Test of Preschool Early Literacy (TOPEL), Leiter-R attention (Leiter), Cognitive Assessment System (CAS) Receptive and Expressive Attention tests, and Beery-Buktenica Developmental Tests of Visual-Motor Integration (VMI) and Visual Perception (VP). Reduced near VA, stereoacuity and accommodative lag were classified based on the distribution of the emmetropes.

Results:

492 children (244 hyperopes [$+3.8D \pm 0.8$ sphere] and 248 emmetropes [$+0.5D \pm 0.5$ sphere]) participated. After adjusting for age, race/ethnicity, and parent education, hyperopes scored significantly lower than emmetropes for TOPEL overall and for Print Knowledge ($p \leq 0.01$ all comparisons), with greater deficits in hyperopes with $\geq 4D$. The largest deficits were observed in hyperopes with near VA of 20/40 or worse or stereoacuity of 240" or worse for TOPEL overall or Print Knowledge ($p \leq 0.002$ all comparisons). No significant difference was found for Phonological Awareness ($p=0.39$). Mean Leiter score was worse in hyperopes compared to emmetropes ($p < 0.001$ for 3-6D). Mean CAS Receptive attention score was worse in 4-6D hyperopes compared to emmetropes ($p=0.01$). Hyperopes with near VA of 20/40 or worse or stereopsis of 240" or worse had lower scores than emmetropes for Leiter, CAS Receptive attention, VMI, and VP ($p \leq 0.03$ all comparisons). More hyperopes (65%) than emmetropes (17%, $p < 0.001$) had ≥ 1 reduced visual skills, increasing to 82% among the $\geq 4D$ hyperopes.

Conclusions:

Uncorrected hyperopia in 4- and 5-year-old children is associated with significantly worse performance on a measure of early literacy, particularly in those with reduced near VA or stereoacuity. Hyperopic children also showed deficits in sustained visual attention. Hyperopic children with reduced visual function also had lower scores on VMI and VP than emmetropic children. A higher prevalence of reduced visual skills was also observed in the moderately hyperopic preschool children as compared to emmetropes.

Biography

Dr. Marjean Taylor Kulp received her OD and master's degrees from The Ohio State University. She served as PI at the OSU clinical center for the Convergence Insufficiency Treatment Trial (CITT) and serves as OSU clinical center PI and Vice Chair for the CITT-Attention and Reading Trial. She also serves as a PI for the Vision In Preschoolers – Hyperopia In Preschoolers Study along with Dr. Elise Ciner. Dr. Kulp served (with Dr. Paulette Schmidt) as a Co-Investigator at the OSU Clinical Center for the Vision In Preschoolers Study. She is a member of PEDIG and serves as Hyperopia Treatment Study co-chair. She is currently a tenured Distinguished Professor at OSU.

ORAL PRESENTATIONS Wednesday 21st June

10.00am

Title: Differences in reading ability are associated with differences in visual perceptual skills in primary school-children

Presenting Author: Jim Gilchrist

*Brendan T Barrett, Caroline Chambers[^], James M Gilchrist**

School of Optometry & Vision Science, University of Bradford, Bradford, UK.

Background:

It is obvious that visual impairment adversely affects ability to read, but how vision is related to reading ability in normally-sighted schoolchildren is much debated. The purpose here was to examine the association between reading ability and measures of visual and oculomotor function.

Methods:

125 children (aged 8-9 years) were recruited from two schools. Standardised tests of reading (YARC) and of visual perceptual skills (DTVP-2) were administered. We also measured visual acuity, stereopsis, and accommodation and vergence amplitude and facility.

Results:

Adopting a criterion for statistical significance of $p < 0.01$, the only significant association between YARC accuracy scores and clinical measures was for binocular accommodative facility ($p = 0.009$). YARC accuracy scores were significantly correlated with all DTVP-2 measures (app $p < 0.001$), except figure/ground ($p = 0.014$). Using cluster analysis of YARC scores, the sample was divided into three groups, representing children with below-average ($n = 36$), average ($n = 55$) and above-average ($n = 34$) reading ability. None of the clinical measures of vision differed significantly between these groups. However, ANOVA revealed significant differences between the groups (all $p < 0.001$) except for the figure/ground sub-test ($p = 0.016$). DTVP-2 scores were also strongly associated with phonological, visual spatial attention and short-term/working memory measures (all $p < 0.001$).

Conclusion:

Common clinical measures of visual and oculomotor function generally show little evidence of association with reading performance. However, visual perceptual skills are significantly different in groups of children of different reading ability. Whether visual perceptual problems represent the cause of poor reading or are merely co-morbid with other deficits remains to be determined.

[^]Funded by a College of Optometrists PhD studentship.

ORAL PRESENTATIONS Wednesday 21st June

10.20am

Title: Slow reading and fine motor deficits in school-age children with anisometropic amblyopia

Presenting Author: Krista Kelly

Krista R Kelly, Sarah E Morale, Reed M Jost, Angie De La Cruz, Nikita Tangella, Eileen E Birch*

*Pediatric Vision Laboratory, Retina Foundation of the Southwest
Dallas, TX*

Background:

Strabismic amblyopia is related to slow reading and fine motor deficits. We recently reported that amblyopia, not strabismus, is the key factor in slow reading in children. No studies have focused on reading and fine motor impairments in children with anisometropic amblyopia without strabismus.

Methods:

Reading and fine motor skills of children age 7-13 years with anisometropic amblyopia were compared to age-similar controls under binocular viewing conditions. Children silently read a grade-appropriate paragraph; reading rate (words/min), and # of saccades (per 100 words) were recorded using the ReadAlyzer®. Children also transferred answers from a sample test to a multiple choice answer sheet as quickly and accurately as possible, and completed unimanual and bimanual dexterity tasks from the Movement Assessment Battery for Children 2. Amblyopic eye best-corrected visual acuity (BCVA), stereoacuity, and binocular fixation stability (BCEA; EyeLink 1000) were obtained.

Results:

Compared with controls, amblyopic children (0.2-0.8 logMAR BCVA) were slow at reading (amblyopia: n=24, mean±SD=148±43 words/min vs controls: n=24, 195±64 words/min; p=0.009), slow at transferring answers (amblyopia: n=25, 282±97 secs vs controls: n=21, 233±53 secs; p=0.016), and had low unimanual (amblyopia: n=26, 7.3±3.5 vs control: n=23, 10.0±2.8, p=0.005) and bimanual (amblyopia: n=26, 7.3±3.2 vs control: n=23, 9.5±3.3, p=0.023) standard scores. Slow reading was associated with increased saccades ($r=-0.80$, $p<0.001$) and fixation instability ($r=-0.51$, $p=0.023$). No association with BCVA or stereoacuity was found for reading or fine motor tasks.

Conclusions:

Slow reading and fine motor deficits may hinder academic success in children with anisometropic amblyopia. Accommodations could enhance academic achievement.

Support: National Eye Institute EY022313, Knights Templar Eye Foundation 16-2015-CS, Fight for Sight PD-15-002, Thrasher Research Fund, Orix Foundation, Strauss Foundation, Young Foundation

11.20am

Title: The feasibility of adding retinal nerve fibre layer thickness measures to ERG assessments for monitoring vigabatrin treatment in young (< 3 years) children.

Presenting Author: Carol Westall

*Xiang Ji¹, *Carol Westall^{1,2,3} and Tom Wright³*

¹Institute of Medical Science, University of Toronto

²Department of Ophthalmology and Vision Science, University of Toronto

³Department of Ophthalmology and Vision Science, The Hospital for Sick Children, Toronto

Background

The antiepileptic drug vigabatrin (VGB) is effective in the treatment of the childhood epilepsy infantile spasms. Up to 30% of VGB treated patients have adverse drug reaction VGB retinal toxicity demonstrated by reduction in ERG and reduction in retinal nerve fibre layer (RNFL) thickness. Our purpose was to determine the feasibility of adding hand-held retinal imaging of RNFL thickness to a pediatric (< 3 years of age) VGB monitoring protocol.

Methods

Seventeen children 7 to 18 months of age were recruited. ERG, Optical Coherence Tomography (OCT) and retinal examination were performed under chloral hydrate sedation. RNFL thickness measurements were achieved using Handheld spectral domain OCT (Bioptigen Inc.) using the optic disc cube protocol. The Iowa Reference Algorithms (Retinal Image Analysis Lab, Iowa Institute for Biomedical Imaging, Iowa City) was used for segmentation of superior, temporal, inferior and nasal segments.

Results

ERGs were collected from all children; RNFL data were collected from 15. Six children were tested before, or within 4 weeks of, VGB treatment (baseline) and 9 were tested during treatment (4 – 9 months duration). ERGs in 2 of the VGB treated children were consistent with retinal toxicity; both had RNFL thickness results that were reduced in the superior and inferior quadrants (14% and 30% reduction).

Conclusions

Here we show the feasibility of the addition of RNFL assessment using Bioptigen OCT to our standard monitoring protocol. Follow up assessments are required to evaluate vigabatrin related changes from optic nerve co-morbidities that may be present in children with infantile spasms.

Acknowledgements

This research was supported by Brandon's Eye Research Foundation and OSOTF Graduate Student Scholarship from the Vision Science Research Program (XJ).

12.00pm

Title: Naso-temporal asymmetry for global motion perception in uniocular children

Presenting Author: Arijit Chakraborty

Arijit Chakraborty^{1,2}, Benjamin T. Dunkley², Brenda L. Gallie³, Daphne L. McCulloch¹, Benjamin Thompson¹*

1. School of Optometry and Vision Science, University of Waterloo, Ontario, Canada

2. Diagnostic Imaging, Neurosciences and Mental Health, The Hospital for Sick Children, Ontario, Canada

3. Ophthalmology and Vision Sciences, The Hospital for Sick Children, Ontario, Canada

Background:

A naso-temporal asymmetry for global motion perception, favoring nasalward motion, has been reported for teenagers and adults who underwent unilateral enucleation in early childhood. We investigated whether this directional asymmetry was present at an earlier stage of visual development in a small case-series of uniocular children varying in age from 6 to 12 years (mean 8 years).

Methods:

Global motion perception was measured psychophysically for 6 unicoular children, 1 with unilateral anophthalmia and 5 who underwent unilateral enucleation in early childhood due to retinoblastoma, and in a random eye of 3 controls (6 to 7 years). Motion coherence thresholds (MCT) for leftward and rightward random-dot-kinematograms were measured using interleaved 2-down 1-up staircases. Thresholds were measured at least twice. Visual acuity and contrast sensitivity was measured using the Freiburg Visual Acuity and Contrast Test.

Results:

All uniocular children exhibited a robust naso-temporal asymmetry in favor of nasalward motion (mean nasal MCT: $12 \pm 6\%$ vs mean temporal MCT: $24 \pm 12\%$). The participant with anophthalmia exhibited the largest asymmetry (a factor of 4). No asymmetry was present for controls (mean nasal MCT: $15.6 \pm 6\%$ vs mean temporal MCT: $15 \pm 6\%$ and no participants exhibited abnormal visual acuity or contrast sensitivity).

Conclusions:

Naso-temporal asymmetries for global motion perception are present in uniocular children. This asymmetry highlights the importance of binocular visual input for the normal development of extrastriate areas such as V5/MT+ that support motion integration.

Funding sources: NSERC grant RPIN-05394, RGPAS-477166

ORAL PRESENTATIONS Wednesday 21st June

12.20pm

Title: Noise coherence as a threshold measure of stereopsis

Presenting Author: Daphne McCulloch

Daphne L McCulloch, V Unnisa Begum, Benjamin Thompson.*

School of Optometry and Vision Sciences, University of Waterloo, Waterloo, ON N2L 3G1, CANADA

Background:

The minimum disparity required for discrimination of coherent form within a random dot stereogram is often used for clinical stereo assessment. We have developed a novel measure of stereopsis by randomizing the depth of a subset of stereogram dots (noise dots) to reduce form coherence. The threshold proportion of signal dots required for form discrimination is the coherence threshold. We have explored the parameters affecting coherence thresholds.

Methods

Random dot arrays containing disparity-defined gratings were displayed on a ViewPixx® monitor using LCD shutter glasses. Participants discriminated grating orientation. Form coherence was degraded by assigning random disparities to a variable proportion of dots. Disparity and coherence thresholds were measured in 10 adult participants using a 1 up 4 down 2AFC staircase. Grating spatial frequency, peak disparity, dot size and dot density were varied.

Results

The mean coherence threshold for the optimal stimulus (1 cpd, peak-to-peak disparity 108 arc min) was 26% ($\pm 11\%$ SD). i.e the surface was detectable with 74% of dots assigned a random disparity. Coherence thresholds rose above 50% for shallow gratings (36' disparity) and for higher spatial frequencies (8 cpd). Dot size and density had minimal effects on coherence thresholds.

Conclusions.

Discrimination of disparity-defined-form is robust to the presence of disparity noise. Measures of noise coherence in stereo testing may enable evaluation and monitoring of children with reduced binocularity and reduced acuity because large dots and coarse disparity levels can be used.

Acknowledgements: This work was supported by grants from the University of Waterloo to Drs McCulloch and Thompson.

1.30pm

Title: Reading and attention in relation to naturalistic accommodation response in typical children

Presenting Author: Siobhan Ludden

Siobhán M Ludden^{1}, Dr Anna M Horwood¹, Prof Patricia M Riddell¹.*

¹University of Reading

Background:

Previous research has found that many children underaccommodate at 33cm. It has been suggested that underaccommodation may be associated with poorer reading ability or attention in children. An ongoing study is investigating typical accommodative responses in children, under naturalistic conditions and exploring the relationship between accommodation and reading ability and attention.

Methods:

30 healthy, typically developing children were recruited from 3 UK primary schools, from varied socioeconomic backgrounds. Children were aged 10-11yrs, without any prior diagnoses of reading or attention difficulties and had passed visual acuity screening at age 4.5-5.5yrs. All children had a minimum distance visual acuity of 0.200 LogMAR and near visual acuity of 0.100 LogMAR. A Plusoptix R09 PowerRef3 photorefractor was used to assess naturalistic accommodation responses objectively at 33cm to a range of targets including; sustained reading of age appropriate text of different font sizes, individual letters, a colourful picture and a visual search puzzle. Reading ability was assessed using the standardised "York Assessment of Reading Comprehension" (YARC) test. Attention measures were obtained using the "Test of Everyday Attention for Children (TEA-Ch)", a standardised attention battery.

Results:

The accommodative responses varied significantly across target types ($F_{5,145}=9.361$; $p<0.001$); higher accommodative responses were observed to more complex tasks such as reading print. No significant correlation was found between accommodation and the measures of reading ability or attention ($p>0.05$).

Conclusions:

In typical children target type influences the accommodative response observed. In older primary school children accommodation does not appear to be correlated with reading ability or attention.

Acknowledgements: Funding source - Fight for Sight charity research grant GS14-40

ORAL PRESENTATIONS Wednesday 21st June

1.50pm

Title: Evidence for fixation instability in children with Down syndrome

Presenting Author: Valdeflors Vinuela-Navarro

Valdeflors Viñuela-Navarro^{1}; Jonathan T Erichsen¹; Julie-Anne Little³; Kathryn J Saunders³; Cathy EM Williams²; J. Margaret Woodhouse¹*

¹*School of Optometry and Vision Sciences, Cardiff University, Cardiff, UK;*

²*School of Social and Community Medicine, University of Bristol, Bristol, UK;*

³*Optometry & Vision Science Research Group, Biomedical Sciences Research Institute, Ulster University, UK*

Background:

A large number of children with Down's syndrome (DS) who attend the Special Assessment Clinic (Cardiff University) are reported by parents and teachers to struggle with scanning strategies in some near school tasks, particularly when these involve arrays of pictures. These anecdotal reports suggest a potential visual scanning deficit in this population.

Methods:

Scanning eye movements from children with DS and controls were recorded using a Tobii TX300 eye tracker while presenting a short series (<5 minutes) of near scanning tasks (25cm) representative of those at school. The number and duration of fixations, the number of saccades, and the time to complete the tasks were obtained for each participant. Means and standard deviations were calculated for each group.

Results:

Successful recordings were obtained from 96% and 60% of the scanning tasks for controls and children with DS, respectively. Results from 26 controls (mean (\pm sd) age 9.48 \pm 2.25 years) and 21 children with DS (mean age 8.36 \pm 2.30 years) suggest that while there are no differences between groups in the number of fixations ($p=0.293$), fixation durations are significantly shorter in children with DS (170ms \pm 40 compared with 260ms \pm 70, $p<0.01$). Additionally, children with DS perform more saccades (23 \pm 10 compared with 12 \pm 8; $p<0.01$) and take significantly longer than controls to complete the scanning tasks (4.3s \pm 1.6 compared with 2.2s \pm 1.7; $p<0.01$).

Conclusions:

The reduced fixation duration and increased number of saccades found in children with DS while performing scanning tasks suggest a fixation stability deficit in DS.

Acknowledgements: This research is funded by Action Medical Research for children

Posters

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Vision screening at two years of age does not reduce the prevalence of impaired habitual visual acuity at 4.5 years of age

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Background:

There is currently insufficient evidence to recommend vision screening for children <36 months of age. This study assessed the effect of comprehensive vision screening, and the sensitivity of age-appropriate tests, at two years of age on habitual visual acuity (HVA) at 4.5 years.

Methods:

Children born at risk of neonatal hypoglycaemia (n=477) underwent a comprehensive vision assessment at 54±2 months including measurement of monocular HVA and binocular vision. Three-hundred and fifty-five (74.4%) had also received vision screening at two years (mean age = 24 ± 1 months), while 122 were not screened previously. The main outcome measure was the prevalence of reduced HVA (worse than 0.3 logMAR) at 4.5 years of age.

Results:

Seventy-eight children had reduced HVA at 4.5 years of age but the prevalence did not differ between children who had previously been screened and those who had not (14.9% versus 20.5%, p=0.15). Twenty-seven children had been referred at two years and reduced HVA remained in 11 (40%) of these children at 4.5 years. When specificity was set at >90%, measures of unaided binocular acuity, non-cycloplegic refraction and stereopsis at 24 months had poor sensitivity (16.3%, 26.9% and 6.5%, respectively) for identifying children with impaired HVA at 4.5 years of age.

Conclusion:

Our findings do not support the adoption of early vision screening as current vision tests suitable for use with two-year-old children have poor sensitivity for predicting mild-moderate habitual vision impairment at 4.5 years of age.

This work was funded by the Eunice Kennedy Shriver National Institute of Child Health and Human Development, the Health Research Council of New Zealand, the Auckland Medical Research Foundation, the Waikato Medical Research Foundation and the New Zealand Association of Optometrists.

Noise coherence stereo thresholds with degraded binocular vision

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Background:

We have designed a novel measure of stereopsis based on coherence thresholds for disparity defined form that is degraded by assigning random disparities to a subset of stereogram dots (noise dots). We investigated the effect of simulated binocular impairment on coherence thresholds.

Methods:

Stimuli were random dot stereograms containing disparity-defined gratings (1.0 cpd) displayed on a ViewPixx® monitor through LCD shutter goggles. Participants (n = 10 adults) discriminated grating orientation. Coherence or disparity was varied using a 2AFC 1-up 4-down staircase. Thresholds were also measured when binocular vision was degraded by inter-ocular luminance differences, interocular contrast differences, uniocular blur or uniocular fogging with Bangerter® filters.

Results:

Without binocular disruption, disparity thresholds were at the limit of the display system (20 arc sec) and coherence thresholds were 26% coherence ($\pm 11\%$ SD). Disparity and coherence thresholds were elevated by inter-ocular luminance and contrast differences and by uniocular blur and fogging. For example, coherence thresholds were elevated to 68% ($\pm 12\%$) and disparity thresholds were elevated to 178 (± 53) arc sec with uniocular blur sufficient to reduce acuity to 6/12. Coherence thresholds showed more systematic effects with binocular disruption and were less variable (lower coefficients of variation) than disparity thresholds.

Conclusions:

Coherent form detection in random-dot stereograms in the presence of disparity noise is a measure of the quality of stereopsis that is complementary to conventional disparity threshold measures. Lower inter-individual variability may indicate an advantage for coherence measures in assessing or monitoring binocular vision anomalies.

Acknowledgements: This work was supported by grants from the University of Waterloo to Drs McCulloch and Thompson.

The Blind Spot in Education Statements/Plans for Children with Special Educational Needs

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Optometry and Vision Science Research Group, Ulster University

Background

Children attending special education schools have a Statement of Educational Need (SEN) or Education Health and Care Plan (EHCP). The purpose of the SEN/EHCP is to identify the child's educational, health and social needs and outline support required to meet these needs. This study aimed to evaluate the record of visual need in the SEN/EHCP against the presenting level of vision measured at an in-school vision assessment.

Methods

Two schools participated. All pupils of participating schools were invited to have a full in-school vision assessment. Parental permission was sought for the authors to view each child's SEN. Presenting vision was defined as the child's habitual level of vision, measured using tests appropriate for each child's age and ability.

Results

To-date, 104 children (aged 5-18 years) have participated. Learning difficulty within the group ranged from moderate to profound. Eleven children (10.6%) presented with a visual impairment as defined by WHO criteria ($>0.50\log\text{MAR}$), of which five had information regarding their vision deficit recorded in the SEN/EHCP. Only one report described how this reduction in vision might impact on education or how the educational environment could be tailored to alleviate visual limitations.

Conclusions

Over half the children in this study who were identified as having significantly reduced habitual vision did not have this information highlighted in their SEN/EHCP. If a child's visual limitations are not communicated and recognised by schools, there is a danger that educational needs and potential may not be fully met.

Acknowledgments

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Investigation of field conditions of early childhood intervention (ECI) with infants with congenital visual impairment: OPTIMUM cohort (England)

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Background

Little systematic information is available on the delivery of ECI for infants with congenital VI, though factors like 'availability' and 'proximity' may influence effectiveness (Guralnick 1991, ICEVI 2002). This study set out to investigate current delivery in a prospective longitudinal study of a national cohort of infants with congenital disorders of the peripheral visual system (CDPVS).

Methods

81 of 90 infants (mean age 13 months) had an identified practitioner. 59 completed diary records of their intervention over 12 months. Results were analysed according to the total sample and vision level groups (PVI – profound VI, light perception at best; SVI – severe VI, 'form' vision).

Results

83% were a qualified teacher of the visually impaired. Diaries showed most delivery was at home with median 6.5 visits (range 0-25) and median 1 nursery visit. Frequency was mainly once per 1 to 4-6 weeks. Children with PVI received a significantly higher number of home visits than those with SVI (median 11, 5 respectively, $p < 0.001$). Frequency of home visits decreased significantly from the first to second six months ($p < .001$) with support transferring to nursery by 26 months. The main ECI method (85%) was the Developmental Journal VI.

Conclusions

In line with global recommendations, ECI was community and home based in the second year of life, with specialist educational provider. The Developmental Journal VI is currently the main method of delivery. High variability in frequency of home visiting and cessation by 2 years may potentially affect the efficacy of ECI, which needs examining.

Acknowledgements: Funding by Fight for Sight, Royal National Institute for Blind People, Great Ormond Street Hospital Children's Charity

Cycloplegic versus non-cycloplegic retinoscopy in children: when can optometrists be confident of achieving the same refractive error measurement with and without eye drops?

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Background and Aims

Cycloplegic retinoscopy is the gold standard method for clinical assessment of refractive error in young children. When is it appropriate to forgo cycloplegia and still expect to achieve an accurate result? The present study investigated the difference between cycloplegic and non-cycloplegic retinoscopy in school-age children and explored the effects of age, spectacle wear and degree of refractive error.

Methods

128 children aged 6-13 years (6-7 years n=26; 8-9 years n=35; 10-11 years n=31; 12-13 years n=32) underwent non-cycloplegic (NCR) followed by cycloplegic (1% Cyclopentolate HCL) retinoscopy (CR). Spectacle wear was self-declared.

Results

The difference between CR and NCR sphere decreased with increasing age ($F_{3, 124}=7.155$, $p<0.0005$), but remained statistically significantly different across all age groups ($p<0.05$) and increased significantly with increasing hyperopia ($t = 5.518$ $p < 0.0005$). Spectacle wearers demonstrated smaller spherical differences between CR and NCR ($F_{1, 126}=4.644$ $p=0.033$). Differences between NCR and CR sphere were not significantly greater than $\pm 0.50D$ in children over 8 years ($p\geq 0.15$). Cylindrical results from CR and NCR did not differ significantly ($t=1.594$ $p= 0.11$); neither age nor spectacle wear influenced this finding ($F_{3, 120}=0.546$, $p=0.652$). ROC analysis revealed NCR spheres $\geq +2.00D$ were relatively sensitive (91.7%) and specific (97.1%) for detection of clinically significant hyperopia ($>+3.00D$) revealed with CR.

Conclusions

Clinicians should expect NCR to reveal less hyperopia than CR, particularly at higher levels of hyperopia. However, after 6-7 years, the difference between NCR and CR results for sphere, are clinically small and indicate that, particularly when NCR reveals low hyperopia ($<+2.00D$) and when monitoring children who wear spectacles, NCR may be acceptable.

Development of stereoacuity during monitored occlusion treatment for amblyopia beyond the conventional treatment age

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Background:

There is limited data on the effect of occlusion therapy on binocularity in patients beyond the conventional age for treatment. We assessed stereoacuity (SA) during electronically monitored occlusion therapy in amblyopes aged 5 to 16 years.

Methods:

The development of stereoacuity and crowded visual acuity (VA) was analysed in 24 patients (mean age 9.5 years, range 5.4-15.8) during 6 months of patching (types of amblyopia: 9 anisometropic, 15 strabismic or combined). Median prescribed occlusion was 6 h/d; occlusion times were recorded using Occlusion Dose Monitors (Simonsz et al. 1999). At study entry (after refractive adaptation), median VA was 0.8 logMAR (range 1.7 to 0.1); with Titmus circles test, 6 subjects had measurable stereopsis.

Results:

Median recorded occlusion dose rate was 4.7 h/d, VA gain was 0.3 log units (range – 0.1 to 1.6). SA improved in 10 subjects (7 of them anisometropic amblyopes), deteriorated slightly in 1, and did not change in the others (overall: $p=0.019$). SA improvement was significantly more prevalent in anisometropic than in strabismic/combined amblyopia (subgroup analysis: $p=0.0007$). Median SA in subjects experiencing changes was 400 arcsec before and 80 arcsec after treatment. SA changes were not significantly related to patient age, recorded occlusion or VA gain.

Conclusions:

Stereoacuity tends to improve in some (especially anisometropic) amblyopes during patching even beyond the conventional treatment age. Within the included range, age does not seem to be a significant factor for changes in stereopsis. Our data is important for comparison with novel dichoptic treatment approaches.

Funding: Augensterne-V.

The Visual Function Classification System: a new classification system for visual function in children with Cerebral Palsy

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Background:

It is reported that about half of the children with cerebral palsy (CP) have some degree of visual impairment, which can be either secondary to the brain damage itself (Central Visual Impairment), or associated to the involvement of peripheral visual structures. In the past 20 years the need for classifying how the disorder underlying CP affects activity and participation has become obvious, and new classification systems for gross motor, manipulative and communicative functions have been developed. To date, no similar classification system for visual function in children with CP is available.

Methods:

In the last three years a task force of professionals and experts in the field of CP and visual disorders has been constituted, to develop and validate, with the contribution of parents and patients with CP, a new classification system for visual function in children with CP: the Visual Function Classification System (VFCS).

Results:

130 children and adolescents with CP were evaluated with the VFCS by at least two different professionals working with the children. Agreement was tested also between professionals and parents. Agreement was high both between professionals and among professionals and parents.

Conclusions:

VFCS is a new valid and reliable instrument to classify visual function and the impact of visual function impairment in the life of children with CP

Testing associative learning in one-year-old children using an eye blink conditioning paradigm

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Background

Impaired eyeblink conditioning (EBC), a form of classical Pavlovian conditioning, has been observed in school-aged children diagnosed with foetal alcohol spectrum disorder (FASD). This pilot study explored the feasibility of using EBC in one-year-olds as an early biomarker for deficits in associative learning among infants exposed prenatally to alcohol.

Methods

Two sessions of 50 paired stimuli (1kHz 80dB auditory tone overlapping with a 100ms corneal air puff) were delivered using a commercial EBC system (San Diego Instruments). Blinks detected with an infrared camera were defined as conditioned (blink on auditory tone) or unconditioned (reflexive blink to air puff) responses. A subset of participants (n=2) were video recorded with EBC responses defined manually.

Results

Eleven out of 27 children (12.4±0.69 months of age) successfully completed both EBC sessions. Testability was significantly reduced from the first to the second sessions (42.11±13.61 versus 26.81±24.73 trials completed, $p=0.001$). Of completed trials, the commercial EBC system recorded a blink for 14.4% of responses. Conditioned responses were observed for 21.5±30.2% and 16.4±24.3% of trials for the first and second sessions, respectively. Comparison between video analysis and automated results from two participants showed that 21.0% of observable blinks were successfully detected with the software, and 3.5% of automated trials defined a blink when none took place.

Conclusions

Poor blink detection in one-year-olds may be improved by using video recording in combination with the commercial EBC system. Other options include piloting multiple infrared detectors, or using electromyography recording of the orbicularis oculi.

Acknowledgements

This work is supported by the New Zealand Health Promotion Agency, the University of Auckland, and the New Zealand Optometric Vision Research Foundation.

Comparison of a VMI screening test to the full form test in Grade 2 children

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Background:

The ability to rapidly screen for children's vision conditions associated with reduced educational performance is fundamental for their timely management. Delayed visual motor integration (VMI) may be a sequelae of uncorrected hyperopia and has been linked with reduced academic outcomes. Currently, vision screenings do not incorporate a test of VMI. This study compares the outcomes of a VMI screening test to its full form.

Methods:

Over two testing sessions, 62 Grade 2 children completed a screening and full form test of VMI (Beery's test of VMI). The screening test consisted of three test plates (19, 20 and 21) selected because they were representative of a level equivalent to the 50th percentile for Grade 2 children's results on the full form test. Sensitivity and specificity of the screening test were calculated.

Results:

Thirty children passed both the screening and full form test and five children failed both the screening and full form test. Only one child failed the full form test that had passed the screening; 26 children failed the screening but subsequently passed the full form test. Resulting sensitivity and specificity were 83% and 54% respectively.

Conclusions:

This study has demonstrated that an age-appropriate VMI screening test can, with good sensitivity, identify children with delayed VMI. Further research is needed to refine a short VMI protocol to improve the test's specificity that can then be incorporated into vision screening batteries to strengthen the ability of the screening to identify children with vision conditions that may affect their learning potential.

Acknowledgments: This work was supported by the Lord Mayor's Charitable Foundation.

Modelling cue weighting for naturalistic vergence and accommodation responses

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Background:

Over the past 15 years, we have created a large data set of typical adult and child accommodation and vergence responses to different combinations of distance cue (blur, proximity and disparity). Here we examined whether these physiological responses could be modelled within a weighted averaging cue combination framework, which has been primarily used to model perceptual estimates.

Methods:

Since it is not possible to determine perceptual psychometric functions for sensitivity to each cue from physiological responses, cue weightings for disparity, blur, proximity, and residual cues, were determined relative to a single prior derived from the intercept of the stimulus response function. The weights generated for the four single-cue conditions were then used to predict responses to two- and three-cue conditions.

Results:

Results demonstrated that a standard cue weighted average model provided a very good fit to the gain of vergence responses in two and three cue conditions which closely matched the response gains in each condition in our dataset.

Conclusions:

Differences in the reliability of the cues is sufficient to determine their relative contribution to driving physiological responses. We further examine how the weighted averaging model can be applied to accommodative responses and to measure how cue weightings alter across the lifespan.

A Special School Eye Care Service in Wales: Pilot project progress and update

Rebecca L John

Cardiff University, Clinical Lead Low Vision Service Wales, Clinical Lead Special School Eye Care Service Pilot.

The Special School Eye Care Service (SPECS) pilot was born in response to the research project 'A Clear Vision' (Woodhouse, 2012), which recognised that children attending special schools are more likely to have a visual impairment and refractive error than their mainstream school peers, but are less likely to be accessing eye care. The project recommended that an optometric service should be provided to pupils attending special schools, within the special school environment.

Since 2013, the 'Special school Eye Care Service' has been piloted in 5 schools across Wales. The Wales Eye Care Delivery Plan (2013) stated the Welsh Government commitment to work to provide an All Wales Special School Eye Care Service. In 2016, a consultation document was shared, proposing the development of the All Wales Special School Eye Care Service. In response to consultation feedback, the remit of the service was increased to include children with additional needs who are educated in mainstream schools.

The Special school Eye Care Service pilot has proved the concept of an optometric service being provided within the special school environment. Work now needs to be progressed to source funding and define models of delivery for an All-Wales service.

Acknowledgements: The Special School Eye Care pilot project is funded by Welsh Government.

Woodhouse, M., 2012, A clear vision: eye care for children and young people in special schools in Wales, https://www.nib.org.uk/sites/default/files/A_clear_vision_English.pdf.

Temporal segmentation of motion and form information in adult poor readers

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A discrete series of eye movements and fixations are made during reading, causing the position of words on the retinae to change over time. To encode text effectively, this temporal stream of visual information must be segmented or parsed into constituent units (e.g. letters, words) but the underlying mechanisms are little understood. Evidence suggests that poor readers have a selective deficit *integrating* temporal information, but it is unclear if their difficulty with word recognition arises at the point of *segmenting* temporal information. We explored this possibility in a group of thirty-eight adults, with a wide range of reading abilities, who viewed random-dot patterns that were temporally segmented by constraining either local motions or analogous form cues to oscillate back and forth at each of a range of rates.

Participants had to discriminate these segmented test stimuli from comparison stimuli containing the same motion and form cues but these were temporally intermingled. The motion and form tasks could not be performed reliably when segment duration was shorter than a temporal resolution (acuity) limit.

Results showed that acuity limits for both tasks were negatively correlated with scores on a composite measure of reading skill. The minimum segment duration needed to discriminate the temporally segmented test stimuli from the comparison stimuli was greater in less-skilled readers than relatively good readers. This pattern of results suggests that for adult poor readers the mechanisms underlying both segmentation and integration of temporally changing local visual cues are impaired.

Evaluation of a training programme to increase teachers' awareness of visual problems in the classroom and how to address them

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Background:

Evidence suggests that children with visual impairment are at a disadvantage to their visual normally peers with regards to educational achievement. Teachers receive limited training in paediatric health disorders, particularly relating to the eyes and visual system. This study aimed to evaluate a programme providing teachers with an overview of visual problems in children and how to identify and address these difficulties in the classroom.

Methods:

Two groups of teachers (in-training n=42 and qualified n=9) attended a lecture and workshop outlining common visual problems in children. The workshop, simulated a range of visual difficulties allowing teachers to gain an insight into how visual impairment may impact on learning. Formal feedback was invited using a questionnaire employing both open and closed questions. Closed questions were graded using a 5-point Likert grading scale. Questions related to each individuals' level of knowledge of 'common causes of visual impairment', 'professionals involved in eyecare' and 'how to address visual problems in the classroom' before and after participating in the session.

Results:

Seventeen questionnaires were returned from the teachers in-training and eight from qualified teachers. Non-parametric analyses were applied. In both groups, a significant improvement in knowledge was obtained for all three areas ($p < 0.05$). Open comments were positive and related to gaining an insight into the learning experiences for children with visual problems and how to overcome potential barriers as a result of visual impairment.

Conclusions:

This novel initiative demonstrated an improvement in teachers' awareness of how visual problems impact on classroom behaviour and learning.

Acknowledgements:

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In-school vision assessments for children in special education: is there a benefit for parents?

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Background

A 2015 SeeAbility report¹ estimates that children with special educational needs are 28x more likely to have a serious vision problem compared to typically developing children, yet over 40% of these children had never had their eyes tested. Little and Saunders² found that even when eye care is accessed, there is often a failure to share information on visual status in an effective way with key stakeholders such as parents and schools.

Full vision assessments were offered to all pupils attending Roddensvale Special School in Northern Ireland, UK. Following this, parents and teachers were provided with a jargon-free report highlighting the child's visual strengths/limitations. The aim of this study was to evaluate parental opinion of in-school vision testing and reporting.

Methods

Parents of 29 children (aged 5-18 years) consented to in-school visual assessment. Reports describing the outcome of the assessment were sent to parents and teachers. Questionnaires were developed and sent to parents to gather their opinions regarding the vision assessment and value of the report.

Results

Fifteen parental questionnaires were returned (52%). 86.6% of responding parents thought it was advantageous providing eye examinations in-school. Reasons included; familiar environment and elimination of long waiting times. Parents said that the report was easy/fairly easy to understand (91.6%), contained information that was useful on a day-to-day basis (66.7%) and in a third of cases revealed new information about vision. However, where home-related vision modifications were indicated, few parents had instigated these adaptations.

Conclusions

Parents found in-school vision assessments beneficial. Reports were helpful to better understand children's needs. Further support may be required to help parents action environmental modifications in response to children's visual limitations.

Acknowledgements: The authors would like to thank staff, parents and pupils of Roddensvale Special School for their participation in this project.

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Do Children with Developmental Co-Ordination Disorder (DCD) have a higher prevalence of vision problems related to reading difficulties?

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Background

Developmental Co-Ordination Disorder (DCD) is a common specific learning difficulty where a child has problems with posture, balance, motor skills and visuo-spatial deficits. This is often accompanied by literacy/reading difficulties. This study investigated the visual status of children with DCD who have reading difficulties.

Methods

22 children with DCD or DCD motor-type deficits aged between 8 and 12.9 years (mean \pm -SD 9.42 \pm 1.25; 18 males) were recruited through Occupational therapists. All were accessing learning support. 22 age and gender-matched typically developing children were recruited through local schools and acted as controls. Data collection included: refractive assessment, visual acuity, stereopsis, ocular posture, near point of convergence (NPC), fusional reserves (FR), saccadic eye movements, accommodative posture and facility. the Developmental Eye Movement (DEM) test and Wilkins Rate of Reading test (WRRT). All participants wore up-to-date spectacle correction.

Results

There was no significant difference in visual acuity, refractive profile or stereoacuity between the two groups ($p>0.05$). However, there was a significant difference in NPC: DCD group mean (\pm -SD) was 15.90cm \pm -3.75, while control mean 7.14cm \pm -3.08 ($t=7.44$, $p<0.00001$). Positive FR break points were lower in the DCD group (mean 12.54PD \pm -5.60) compared to controls (17.54PD \pm -7.71) ($t=-2.42$, $p<0.021$). Saccadic eye movements, WRRT, DEM scores and Accommodative Facilities were also significantly poorer in the DCD group compared with controls ($p<0.0001$).

Conclusion

Children with DCD have a significantly higher prevalence of convergence insufficiency, oculomotor immaturity and accommodative infacility, all of which could directly impact on reading efficiency. Children with DCD require a comprehensive eye examination to elucidate and manage visual deficits.

Acknowledgements: Thanks to Emma Butler, Occupational Therapist, for dissemination of study information, and all the children and parents who agreed to participate in the study.

Early attention in a population of Italian preterm children

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Background

Preterm children have a high risk to develop attention problems. According to the international guidelines and to age specific test, diagnosis cannot be made before 6 years of age. Often teachers and therapists recognize some behavioral patterns at preschool age but no specific tests are available. The aim of the study was to verify the reliability of a new battery on early attention, the early children attention battery (ECAB) in Italian preterm children.

Methods

Preterm children between 3.5 and 5.5 years of age, with I.Q.>85 and typical neurological development were enrolled. ECAB was administered to all of them. This battery includes 8 subtests divided in 3 attention areas: selective attention, sustained attention and attentional control.

Results

Ninety children were assessed (mean gestational age: 28 weeks; mean age at the assessment: 4 years and 4 months). Preterm children showed a higher percentage of failure to the battery when compared with the normative data collected on typically developed term born children matched by age.

Conclusion

Our data suggest that the ECAB can identify the development of problems in attentive functions in preterm preschool children. This can allow an early and specific intervention according to the attention area that is impaired.

Acknowledgments: We would like to thank the authors of the English version of the ECAB, Professor Janette Atkinson and Professor Oliver Braddick

Photorefractive measurements with the PowerRefractor III: comparison of calibration techniques to determine individual Hirschberg ratios

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Background:

Infrared photorefractive with the PowerRefractor (PR) III (PlusOptix, Germany) is a child-friendly set-up, enabling binocular measurement of gaze position, refraction, and pupil diameter. The device uses a population average Hirschberg ratio (HR). This study evaluated the accuracy and repeatability of three calibration techniques for determining individual participant's HR with the PR III: (i) prism-based, (ii) theoretical prediction from biometry, and (iii) empirical, fixation-based measurement techniques.

Methods:

32 adults (emmetropes and corrected myopes) aged 18-40 years participated. The PR III recorded gaze position data for measurement techniques (i) and (iii). (i): HRs were derived from induced gaze positions in the non-dominant eye, covered with an infrared filter, using 4, 8, 12, and 16 dioptres base-in and base-out prisms. (ii) HRs were calculated from corneal curvature and anterior chamber depth measures obtained using the Zeiss IOL Master. (iii) HRs were derived from right eye gaze position data when participants fixated on a sequence of 6 Maltese cross targets, separated from each other in 4° steps on a horizontal line (0-12° either side of central target). All measurements were repeated one week later.

Results:

The mean(\pm sd) HR derived from (i) was significantly higher compared to (ii) and (iii), and demonstrated higher intersubject variability (HR(i) 13.79 \pm 1.36; HR(ii): 12.08 \pm 1.07; HR(iii): 11.09 \pm 0.93) ($p < 0.001$). HR(ii) had the least intrasubject variability (mean difference=0.0037 \pm 0.15, range=0.67) compared to HR(iii) and HR(i) (mean difference=0.0028 \pm 0.18, range=0.77 and mean difference=0.11 \pm 0.97, range=4.47 respectively).

Conclusion:

The theoretical technique had the best repeatability, followed by the fixation-based method. Surprisingly the prism-based technique demonstrated the poorest repeatability, despite its frequent use in other studies.

Acknowledgements: This work is supported by Vice-Chancellor Research Scholarship (VCRS), Department of Education and Learning (PhD) Studentship.

“Problems” and “Solutions” reported by professionals working with children affected by cerebral visual impairment (CVI)

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Introduction

Cerebral visual impairment (CVI) is the most frequent diagnosis for children who are registered as Sight Impaired in developed countries. Despite this there is no consensus amongst professionals on diagnosis, treatment or support and services for affected children vary widely. We aimed to collect data from professionals on what they found problematic or helpful when working with children who have CVI.

Methods

Data were collected from 89 professionals who attended a one-day meeting held for education and health professionals interested in CVI. They were asked to write down any “Problems” or “Solutions” that they had encountered in their work with children who had CVI. The data were analysed in NVivo where codes were collated into themes and sample quotes to illustrate each theme were identified.

Results

The responses comprised 86 “Problems” and 79 “Solutions”. Three themes emerged under each heading. “Problem” themes were (i) Practical difficulties (ii) Communication and awareness and (iii) the complex nature of CVI. The “Solution” themes were (a) Empowerment (b) Inclusion and (c) Equipment. The practical difficulties included lack of time and space. Communication was difficult both between professionals and with families. Team working and supporting others were helpful, as was access to useful specific pieces of equipment.

Conclusions

These data are useful because they reveal some of the problems for professionals working in this area and strategies they have found to be helpful. These data will be used to inform a future complex intervention to improve outcomes for children with CVI.

A systematic review of the definitions of childhood cerebral visual impairment

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Background

Childhood cortical or cerebral visual impairment (CVI) is a poorly understood condition and has no internationally accepted diagnostic criteria. This systematic review aimed to identify the terminologies, definitions and measurement tools used to characterize childhood CVI in the scientific literature.

Methods

MEDLINE, EMBASE, PsychINFO, CINAHL and AMED databases were searched in January 2017 for terms relevant to CVI and childhood. Publications were included if they were original research published in peer-reviewed journals, concerned childhood CVI, contained a definition of childhood CVI and described their measurement tools for identifying CVI. Qualitative thematic analysis was used to identify common concepts within definitions and descriptive analyses quantified their prevalence and the measurement tools for CVI.

Results

Forty-one articles met inclusion criteria. The most common term for CVI was “cortical visual impairment” (n=22). Three themes of CVI were found, concerning visual deficits (n=37), brain integrity (n=31) and eye health (n=21), and each containing specific subthemes. The most common subthemes were ‘visual impairment’ (n=20), ‘retrochiasmatic pathway damage’ (n=13) and ‘normal/near normal eye health’ (n=15). A range of assessments were used with no patterns found.

Conclusions

This systematic review found diverse terminologies, definitions and assessments for childhood CVI. The most commonly appearing concepts lead to the definition of *visual impairment caused by damage to the retrochiasmatic pathways with normal/near normal eye health*. However, this may not be the most useful definition for reaching an operational consensus of childhood CVI. Further work is being undertaken to develop a systematic clinical assessment framework for identifying the condition.

Acknowledgments

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Detection vision development in a national cohort of young children with severe to profound visual impairment: OPTIMUM cohort

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Background

Understanding of a young child's vision level is essential to guiding developmental advice, however there is currently no widely accepted standardised way to assess /monitor vision if children with the lowest levels of vision are unable to complete a formal measure of resolution acuity. This study aimed to investigate the development of near detection acuity using the Near Detection Scale (NDS), developed by Sonksen, in children with severe to profound visual impairment (SVI/PVI).

Methods

A longitudinal observational investigation of a nationally recruited cohort of infants (N=80) with congenital disorders of the peripheral visual system; entry age 8-16 months (T1) followed up 12 months later (T2); mean age 13 months (T1) and 26 months (T2). Detection acuity using NDS and resolution acuity where possible, were assessed.

Results

At T1 22 (27.5%) children were PVI (light perception at best) and 58 (72.5%) SVI ('form' vision). From T1 to T2 all children were testable with the NDS, however only 35% and 56% (respectively) achieved a resolution acuity. One child improved from PVI to SVI, 85% of SVI (40/47 not at the ceiling of the test) showed an increase in vision level and the median change in NDS was 1.0 (range -1 to 7, SD 1.68). The pattern of vision development varied with vision disorder.

Conclusions

A standard measure of detection acuity is feasible in young children with SVI/PVI, when resolution acuity measurement is not possible. In children with SVI an improvement in vision remains possible after 12 months of age.

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EUSCREEN Study: Cost-optimized childhood vision and hearing screening programmes throughout Europe and beyond

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Purpose: Across Europe childhood vision and hearing screening programmes (VAHSPs) vary with regard to age and frequency of testing, tests used, uptake, screening professionals, referral pathway and funding.

Methods: Data on VAHSPs, demography, administration, general screening, screening professions, uptake and treatment availability are gathered in a network of screening professionals in 41 European countries, one for general screening, one for vision screening and one for hearing screening, and used in a disease/health system modelling framework to predict benefits and cost in the most optimal health system, taking regional diversity and organisational and resource requirements into account.

Results: Cost-optimised, model-developed VAHSPs will be tested in the county of Cluj in Romania for vision, and in the counties Tirana, Progadec and Kukes in Albania for hearing screening. A generic strategy for implementation will be developed by detailed tracking, and from identified requirements, facilitators and barriers.

Conclusions: The decision-analytic modelling framework and the strategy for implementation will be packed into a transferable TOOLKIT that will assist healthcare providers and policy makers worldwide in their decisions to introduce or modify VAHSPs, and increase effectiveness, efficiency and equity of child healthcare.

Steady state visual ERPs distinguish dyslexic from normal readers

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Several studies have suggested that many dyslexics have impaired visual magnocellular (M-) function. M- ganglion cells respond non-linearly to both light/dark and dark/light transients, so they respond best at the 2nd harmonic of the stimulus frequency, whereas parvo (P-) cells are linear and respond best at the fundamental. Hence if dyslexics have an impaired M-system their 2nd harmonic ERP response should be relatively weaker than that at the fundamental compared with normal readers.

Dyslexic and control children's reading and general cognitive skills were compared. They then viewed high or low contrast chequer boards reversing in contrast whilst their EEGs were recorded from scalp positions O1 and O2. Spectral analysis was used to compute EEG power at the fundamental (5 Hz) and 2nd harmonic (10 Hz).

The dyslexics had similar cognitive abilities to the good readers in general, but their reading and spelling were significantly worse. All the dyslexics displayed significantly greater EEG power at the chequer board fundamental frequency (5 Hz) than at the 2nd harmonic, whereas all the typical readers showed relatively greater power at the 2nd harmonic. In addition the ratio of second harmonic to base frequency power predicted reading relative to general ability in all the participants.

These results suggest that simply measuring the EEG ratio of second harmonic to base frequency power in response to a reversing chequer board stimulus may be a reliable way of identifying visual magnocellular deficits in dyslexia.

Treatment of amblyopia using Personalized Dosing Strategies: Statistical modelling and clinical implementation

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Background:

The purpose of this paper is to describe the generation of a computerised model for personalising dosing strategies (personalised dosing software (PDS)) of patching to treat childhood amblyopia and how this has been implemented into a randomised occlusion dosing strategies (RODS) clinical trial.

Methods:

Statistical modelling analysis was undertaken on a combined data set of the Monitored Occlusion Treatment for Amblyopia Study (MOTAS) and the Randomized Occlusion Treatment for Amblyopia Study (ROTAS). A patient's total effective occlusion dose (TED) was used then converted to daily patching doses for fixed follow-up periods.

Results:

Occlusion data for 149 participants with amblyopia; anisometropic in 50, strabismic in 43, and mixed in 56 was analyzed. Median visual acuity in the amblyopic eye; at start of occlusion was 0.40 logMAR (quartiles 0.22 and 0.68 logMAR) and at end of occlusion was 0.12 (quartiles at 0.025 and 0.32 logMAR). Median lower and upper estimate of total effective dose was 120 hours (quartiles 34 and 242 hours), and 176 hours (quartiles 84 and 316 hours) respectively. Exploratory plots depict a piecewise linear relationship ($p = 0.008$) breakpoint at 2.16 (standard error 0.51) hours/ day indicating doses less than 2.16 hours a day are less effective.

Conclusion:

We introduce the concept of a total effective dose of occlusion prescribed based on personal patient characteristics. Predictors used to calculate total effective dose using PDS are residual amblyopia, amblyopia type, and age at the start of occlusion therapy. Dose-rates prescribed range from 2.5 to 12 hours/ day adopting a 12-week follow-up period.

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Electrophysiology in infantile nystagmus syndrome

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Infantile nystagmus syndrome (INS) – traditionally congenital nystagmus, presents involuntary oscillations of the eyes, with usual onset within the first six months after birth. INS is of various types and wave forms, which can be identified with nystagmography. Diagnostic approach is clinical ophthalmologic, with pediatric examinations, neuroimaging and genetics.

Electrophysiological examination in INS is of great importance to identify possible sensory defects, especially in non-verbal children, in visual deficit with clinically normal fundi, in looking for asymmetries, the methods are objective and non-invasive. Electrophysiological recording methods in infants, small and schoolchildren are demonstrated, concentrating on electroretinography (ERG).

ERG recordings are shown in infants with nystagmus due to retinal disorders e.g. Leber's congenital amaurosis (LCA), achromatopsia, EORD. ERG techniques can also differentiate between complete and incomplete congenital stationary night blindness (c, i CSNB).

Normal ERGs compared to healthy controls were recorded in »idiopathic« INS, while in children with severe optic nerve hypoplasia and albinism ERG recordings showed increased a and b wave amplitudes, cone and 30 Hz response, while ERG latencies were shorter. The findings suggest normal retinal function with possible effect of retinal hypopigmentation in albinism, and help to diagnose early onset retinal dystrophies.

The underlying disorder in INS can be identified clinically and electrophysiologically in over 80% already in the first months of life.

No financial interest

Sources of information for clinical decision-making in paediatric optometry

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Background:

Evidence-based practice involves the best available research evidence, the practitioner's experience and the patient's preferences. Previous studies have found that optometrists make little use of research as a basis for clinical decisions. This study investigates the basis of clinical decisions in paediatric optometry.

Methods:

A 14-item questionnaire was designed, piloted and made available online to Local Optical Committee members. The questionnaire asked about demographics and about the sources of information used when making clinical decisions with pre-school patients.

Results:

293 optometrists responded. On average, respondents spent 33% of their working year in multiple practice, 53% in independent practice, 7% locum and 6% hospital practice. They had spent between 1 and 55 years in practice (mean 21.5). Respondents reported using the following sources, each with similar frequency, as a basis for their clinical decisions with paediatric patients: undergraduate education, postgraduate education, advice from colleagues, College of Optometrists' guidance and peer-reviewed research. Internet searches were rarely or never used by almost 80% of respondents, and the Cochrane library was rarely or never used by 98% of respondents. No association was found between practice type and frequency of use of any of the sources (Chi squared test $p > 0.1$).

Conclusions:

This sample of optometrists, when examining pre-school patients, use sources such as education or advice from colleagues as often as they use peer-reviewed research or evidence-based clinical guidelines. Almost none of the sample reported ever using the Cochrane library, suggesting very limited uptake of this source of freely available high level research evidence.

Acknowledgements: We thank the Local Optical Committee for making our questionnaire available to their members.

Application of facial anthropometry to spectacle frame design in children with Down's syndrome

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The majority of children's spectacle frames are scaled-down versions of frames designed for adults. Since the developing nose shape is different from the adult nose, the resultant fit tends to result in movement of the spectacle frame downwards on the face so that the child peers over the top rim; rendering the spectacles both optically ineffective and uncomfortable. Children with Down's syndrome have a relatively high prevalence of both refractive error and accommodative problems which result in a need to prescribe multifocal spectacles where lens positioning is crucial in obtaining optimal vision at distance and near.

Children with Down's syndrome tend to have a flatter, lower bridge of the nose which significantly reduces the bearing surface for the spectacles to rest upon. In addition, the head and temple width are relatively larger but the nasal angles are flatter in the transverse plane and narrower in the frontal plane.

The aim of this cross-sectional study is to define anthropometrical data to produce a range of frames which are specifically designed to fit these children and hence deliver refractive correction in both a stable and comfortable manner.

Facial anthropometry was captured using a series of medical imaging cameras producing an accurate three-dimensional image; captured in less than two milliseconds which is conducive and safe for young participants.

Data will be presented to illustrate differences in facial measurements compared to age-matched controls in 46 children with a mean age of 6.75 years (SD 3.72), range 0.39-12.32 years.

Acknowledgements: Association of British Dispensing Opticians

How annoying is it for children to get eye drops?

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Background:

In the Netherlands each year 10.000 children visit an ophthalmologist or orthoptist. All children under the age of 12 get eye drops during their first visit. Children under the age of 12 wearing glasses receive eye drops every year. From our clinical experience, we have got the impression that eye drops are the most annoying part of the ophthalmological examination. This study is part of child-centered care at Bartiméus Centre for Rare Visual Disorders.

Aim of the study is to analyze how and why eye drops are annoying. Furthermore the experience of getting eye drops is linked to the different ages of children.

Methods:

During conversations with children (very experienced in ophthalmological examinations) we analysed which aspects of the examination are experienced as most annoying. The degree of anxiety is measured with the Wong-Baker Pain Scale.

Results and conclusions:

Getting eye drops is the most annoying experience during ophthalmological examination. The degree of anxiety experience in relation to age and experiences with the eye drops will be presented.

Insight in the experiences of children during the ophthalmological examination, and in particular during the eye drops, gives the professional the opportunity to anticipate as best as possible the behaviour of children. This leads to better child-oriented care.

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Visual profile of children with Down's syndrome and Nystagmus: A retrospective study

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Infantile nystagmus, an involuntary oscillation of the eye, is one of the most common visual impairments occurring in children with Down's syndrome. This study was conducted to investigate the visual characteristics of children with both Down's syndrome and nystagmus, compared to children with Down's syndrome who do not have nystagmus. Clinical records of 198 children in the Down's Syndrome Vision Research Unit cohort between 1992 and 2016 were reviewed retrospectively. Information on the visual acuity, refractive error, ocular alignment, motility and accommodation were obtained. Thirty six of the 198 children were found to have nystagmus, indicating a prevalence of 18.2%. The findings from this study enable us to understand further the impact of nystagmus on the visual function of children with Down's syndrome and explore the possible etiologies of such a high prevalence of nystagmus in people with Down's syndrome compared to that of a typically-developing population.